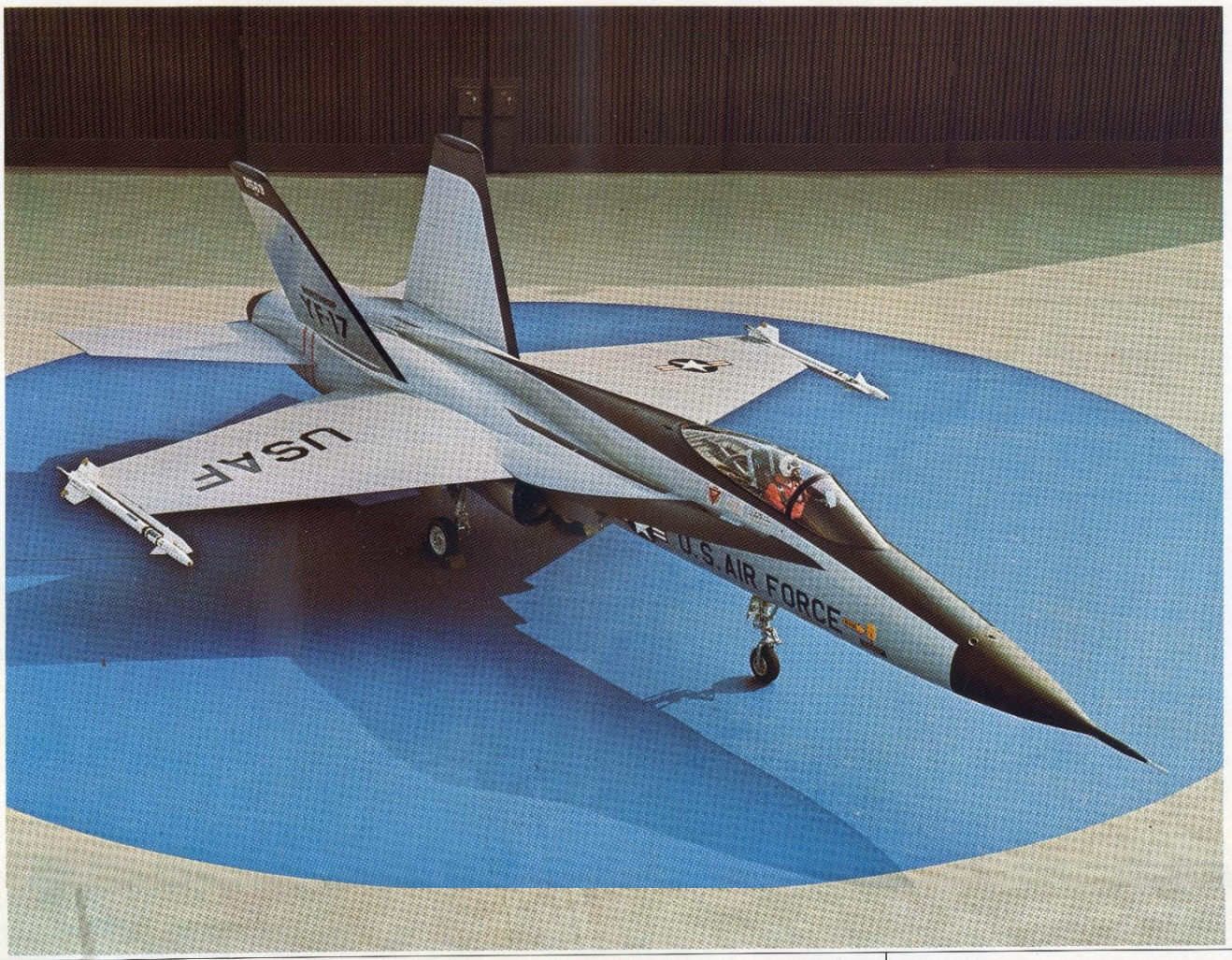



# NORTHROP NEWS

YF-17
SPECIAL EDITION

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# YF-17, World's Newest Jet Fighter, Makes Its Debut

## Suppliers, Divisions Participate

### *Major Suppliers From 14 States*

Major systems and components for the YF-17 are produced by 25 different suppliers in 14 states, ranging from Minnesota to Arkansas and Vermont to California. Many other manufacturers have produced other parts for the aircraft. The cooperation of all suppliers and subcontractors with Northrop has made possible the successful completion of the YF-17 and today's presentation.

Major items and the supplier of each are:

YJ101 engines—General Electric

Control stability augmentor system — Sperry Rand Corp.

Radar — Rockwell International Corp.

Linear actuators — Plessey Industries, Inc.

### *YF-17 Cooperative Northrop Venture*

All Northrop divisions are participating in the YF-17 technology demonstration aircraft program, manufacturing a variety of components and assemblies which comprise the world's newest jet fighter prototype.

The Electronics Division is participating in the design and manufacture of the gunsight head up display, supplying the TOP/20 (Task Oriented Processor/20) general purpose, lightweight, low-power, airborne digital computer for the system. The TOP/20 weighs only 13 pounds and occupies less than a quarter of a cubic foot of space in the aircraft.

As in the F-5E program, Electronics also manufactures elec-

(See SUPPLIERS AND DIVISIONS, page 2)

The world's newest jet fighter made its debut at the Aircraft Division in Hawthorne today as Northrop unveiled the first of two YF-17 prototypes, an aircraft designed to demonstrate that technology can be used to increase the performance and decrease the cost of advanced fighter aircraft.

The YF-17, which will be able to outmaneuver any operational aircraft known, made its debut against a backdrop of four other high performance, low cost Northrop aircraft — T-38 Talon, F-5A tactical fighter, F-5B fighter-trainer and F-5E International Fighter.

"Together," said Northrop President Thomas V. Jones, "these aircraft demonstrate the successful 20-year evolution of Northrop's application of technology to design advanced fighters at a cost which has permitted procurement of the aircraft in necessary quantities."

Mr. Jones noted that Northrop has produced more than 2000 F-5/T-38 aircraft that are in service or on order with 23 nations around the world.

Keynote speaker at the unveiling ceremony was the Honorable John L. McLucas, Secretary of the Air Force.

Northrop developed the YF-17 under an innovative U.S. Air Force contract that has continually encouraged the company to explore the latest available advanced technologies. As a result, the YF-17 features technological breakthroughs in aerodynamics, propulsion and advanced graphite composite materials, as well as an improved pilot environment.

The U.S. Air Force has no commitment to produce the YF-17, however, in order to emphasize the low cost objectives of the program, the Air Force established a flyaway cost goal of $3 million per unit in fiscal year '72 dollars, if 300 aircraft are produced at a rate of 100 per year.

Northrop's YF-17 design is the culmination of eight years of company research aimed at developing the technologies needed for advanced, high performance fighters to be operational over the next 25 years. The company's research program includes more than 1.6 million engineering man-hours and 10,000 hours of wind tunnel testing and flight simulation.

In order to fulfill the USAF objective of demonstrating advanced technology to the greatest possible extent, Northrop selected General Electric's new YJ101 15,000 pound thrust class engine. GE has designed and produced more fighter engines than any other manufacturer in the world. The YF-17 aerodynamics, coupled with the advanced engine, should result in an aircraft capable of flying supersonic without afterburners.

"The combination of advanced aerodynamics and engines," said Roy P. Jackson, vice president and YF-17 program manager, "is an

(See DEBUT, page 2)

# DEBUT — YF-17 Shown to World

(Continued from page 1)

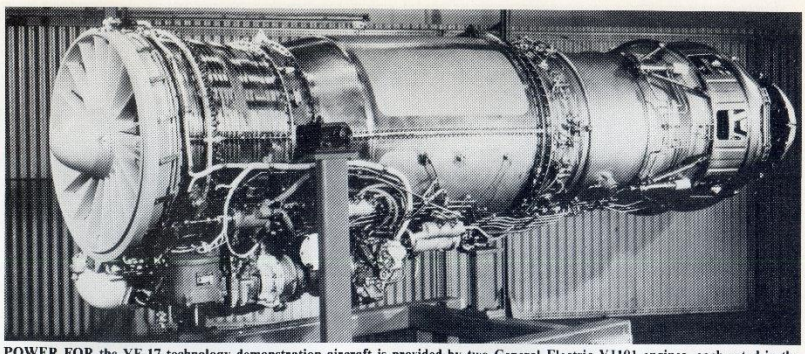
excellent example of the way in which creative technology can be applied to increase performance and reduce costs."

Other features of the new Northrop YF-17 include extensive use — more than any other aircraft — of graphite composites, an advanced structural material that weighs 30 per cent less than aluminum and has twice the tensile strength of steel; a tilted cockpit seat designed to increase pilot tolerance during combat maneuvering; and a bubble canopy for unrestricted pilot vision.

In the YF-17 design, the airplane is being given back to the pilot, since he can now perform air combat maneuvering in an environment never before possible in a high performance fighter.

According to Mr. Jackson, the company continued to refine the YF-17 design even while the first prototype was under construction in order to provide the USAF with an aircraft with characteristics closer to a possible operational air combat vehicle. "We did not 'freeze' the design of the first prototype during construction and we are not 'freezing' the second," he said.

The YF-17 will make its maiden flight this spring at Edwards AFB. The second prototype is now in final assembly.



**POWER FOR the YF-17 technology demonstration aircraft is provided by two General Electric YJ101 engines, each rated in the 15,000 pound thrust class, and designed specifically to complement the aircraft's advanced aerodynamic features.**

## SUPPLIERS AND DIVISIONS

(Continued from page 1)

Graphite composites — Hercules, Inc.

Fuel tanks — The Firestone Tire & Rubber Co.

Canopy — Sierracin Corp.

Instruments — Gull Airborne Instruments, Inc.

Air data computer — The Bendix Corp.

Oxygen converter — Essex Cryogenics Industries, Inc.

Transponder — Teledyne Electronics

Pilot ejection seat — Stencil Aero Engineering Corp.

Brakes — The Goodyear Tire & Rubber Co.

Gunsight head up display — JLM International, Inc.

Inertial navigation system — Litton Industries, Inc.

Landing gear — Cleveland Pneumatic Co.

Rudder pedal assembly — Grumman Aerospace Corp.

Linear actuators — Barber-Coleman Co.

Aileron and horizontal actuators — Parker Hannifin

Gun/ammo handling — General Electric

Gearboxes — Kelsey-Hayes Co.

Angle of attack system — Rosemount, Inc.

Speed brake cylinders — Asco Machine Products, Inc.

Environmental package — United Aircraft Corp., Hamilton Standard Division

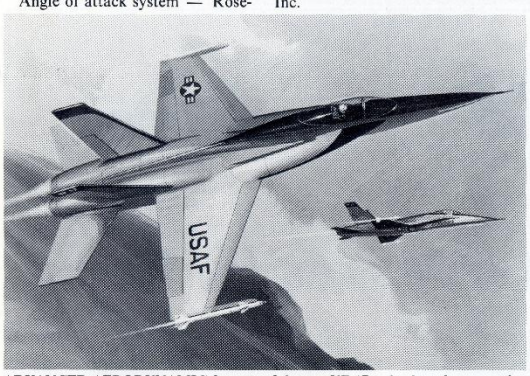
Flap actuators — Datron Systems, Inc.

Electronic assemblies used in the weapon delivery system.

Precision Products Department, Norwood, Mass., manufactures gyros and associated electronics for the stability augmentation function of the YF-17 autopilot.

Ventura Division has extensive capability and experience in designing and fabricating fiberglass aircraft components, and produces most of the fiberglass used in the YF-17 aircraft. Major parts include the airbleed system for the boundary layer control system, vertical tips for the tail surfaces, engine inlet lips, outside fairings for wing pylons, flap and actuator fairing assemblies, forward portions of the leading edge extensions, horizontal stabilizer tips and all access doors.

The Electro-Mechanical Division at Anaheim fabricates a variety of miscellaneous machine parts for the YF-17.




**ADVANCED AERODYNAMIC features of the new YF-17 technology demonstration aircraft will enable the new fighter to be 40 to 50 per cent more maneuverable than any aircraft now in operational use. Contributing to this performance are the unique placement and angle of the YF-17's twin vertical tails; leading edge extensions along the forward part of the fuselage; air flow slots where the wing meets the fuselage; placement of the horizontal tail lower than the wing; leading and trailing edge flaps; and enlarged engine air inlets.**

### FROM ENGINES TO MATERIALS

# YF-17 Has Latest Technological Advancements

Northrop's research in the development of high performance fighter aircraft has resulted in a number of technological advancements applicable to the YF-17, notably in propulsion, aerodynamics, advanced graphite composite material usage and pilot effectiveness.

**Propulsion**

The YF-17 is powered by twin General Electric YJ101 engines, developed specifically to match the aircraft's mission of air superiority, with maximum performance in the air battle arena. The YJ101, GE's newest turbojet design, is rated in the 15,000 pound thrust class and has a thrust-to-weight ratio of approximately 8:1. Compared to GE's world-renowned J79 engine, the first engine developed to power aircraft at speeds of Mach 2, the YJ101:

- is one-third shorter
- is one-half the weight
- contains 40 per cent fewer parts
- has almost twice the thrust-to-weight ratio
- has eight fewer rotating stages

Thrust of the J79 at its inception was comparable to the present thrust of the YJ101.

GE successfully completed the USAF/Prototype Preliminary Flight Rating Test (PPFRT) for the YJ101 engine in December 1973. PPFRT completion was accomplished just 18 months after the engine's first run in July 1972, and the engine recommended for flight tests by a USAF Propulsion Review Board after only 1200 hours of ground test running, which includes simulated altitude testing at the Air Force's Arnold Engineering Test Center.

**Aerodynamics**

The YF-17 will be 40 to 50 per cent more maneuverable than any other fighter now in operational use. Performance not previously achievable is gained through aerodynamic design refinements that increase lift and reduce critical drag during the sustained hard turns encountered in aerial combat. The key to this maneuverability is the innovative technology of the Northrop hybrid wing.

Because the YF-17 will reach high angles of attack well beyond the range of current operational fighters, stability and control characteristics have been emphasized. NASA wind tunnel tests of the YF-17 design revealed good handling qualities at a 45 degree angle of attack — performance usually associated only with lifting body vehicles. (Today's operational fighters begin to exhibit poor handling and stall characteristics at 28°-30° angles of attack.)

The advanced aerodynamic features of the YF-17 are evident at first glance at the aircraft's external appearance:

- The hybrid wing — moderately swept basic wing combined with highly swept leading edge extension—significantly increases lift, reduces drag and improves handling qualities, particularly during hard turning maneuvers of aerial combat.
- Leading and trailing edge flaps, completely automatic and variable during combat, enhance maneuvering performance.
- Location of horizontal tail lower than the wing increases longitudinal stability at high angles of attack.
- Twin canted vertical tails are sized, located and angled to provide positive directional stability at very extreme angles of attack.
- Engine air inlets are designed for maximum performance during transonic and supersonic flight where most air combat is carried out. Unique slots where the wing joins the fuselage provide maximum air flow stability in the inlet throughout the entire operating envelope of the aircraft.

**Graphite Composites**

The YF-17 contains more advanced graphite composite assemblies — approximately 900 pounds — than any other airplane in existence. Sixty-four separate structural components — flaps, doors, fuselage sections, speed brakes — are made of graphite composite, an acrylic thread material that has twice the tensile strength of steel but is 30 per cent lighter than aluminum. Along with the investigation of other advanced technologies, the YF-17 will be used to explore the potential of graphite composites in future aircraft applications.

**Pilot Effectiveness**

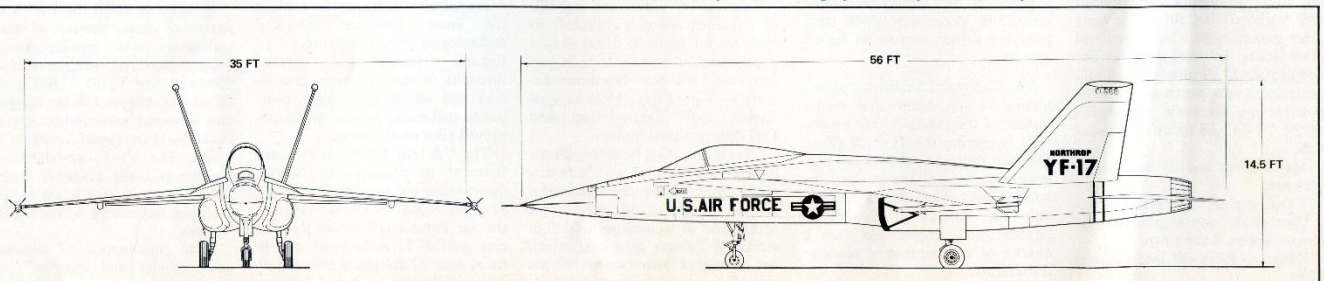
The YF-17 flight test program will permit demonstration of the full aerodynamic features of the aircraft because of the advanced design of the pilot environment.

The clear bubble canopy gives the pilot all-around vision at eye level and above, and unrestricted vision over the nose and sides of the aircraft.

The pilot's tolerance to the forces of gravity — the "g" forces encountered during sustained hard turns in combat situations — has been increased by tilting the seat back 18° from the vertical and raising the pilot's heels five inches, effectively putting the pilot in a position similar to that of a reclining chair.

The YF-17's pilot seat is lighter and more comfortable than its predecessors. It has been successfully tested for ejection at speeds ranging from zero to 600 knots. In addition, the pilot seat has been successfully tested for inverted ejection at 200 feet above ground level, compared to 500 feet levels common to seats currently in use.

**PUTTING THE final touches on the YF-17's wing trailing edge flap, one of 64 separate structural components of the YF-17 fabricated from advanced graphite composite material.**




USAF/NORTHROP YF-17 SPECIFICATIONS:
Length: 56 feet
Height: 14.5 feet
Wingspan: 35 feet
Wing area: 350 square feet
Propulsion: Two General Electric YJ101 twin-spool, afterburning turbojet engines, each rated in the 15,000 pound thrust class
Maximum speed: Mach 2 class
Radius of action: More than 500 nautical miles
Ferry range: More than 2600 nautical miles with external fuel tanks retained
Clean takeoff distance: Substantially less than 1000 feet
Landing distance: Less than 2000 feet, normal landing weight, without braking chute
Takeoff weight: 23,000 pounds
Armament: Two infrared missiles and one 20mm Vulcan M-61 gun